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TITLE METALLURGICAL ANALYSIS OF MBC450-31 HERMETIC ELECTRIC CONNECTOR

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ABSTRACT

A metallurgical analysis of the spring clips of a MBC 450-31 connector assembly was requested in Additional Analysis Requirements AR 257303 dated September 9, 1966. UER U257303 and UER U262609 reported a failure of current flow in the connector. Analysis found no metallurgical defects. However, contact pins were found to be contaminated with Dow Corning A-4000 an adhesive used to hold a silicon rubber insert in place on the connector.

KEY WORDS

MBC 450

Dow Corning A-4000

Inconel

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LIST OF FIGURES

1.0 OBJECT

The object of this study was to determine whether metallurgical defects existed in the contact pins of connector assembly MBC450-31.

2.0 BACKGROUND

As reported in Unplanned Event Records U257303 and U262609 dated August 3, 1966 and September 14, 1966 respectively, a part 60B67224-7C, Transducer Assembly, serial number 0147005, effectivity 501 failed to operate in a proper manner. The nonconformance of part 60B67224-7C was traced to a malfunction of connector assembly MBC450-31, shown in Figure 1. Additional Analysis Requirements AR 257303 dated September 9, 1966, requested that the Materials and Processes Group perform a metallurgical analysis of the four contact spring clips of the connector body MBC450-5. The drawing for the connector body, MBC450-5, Figure 2 shows that contact pins A and B are made of stainless steel, pin C of chromel and pin D of alumel. Specification MBC450 does not designate the exact alloy compositions or any specific manufacturing techniques to be followed by the vendor. This part was manufactured by Physical Sciences, Inc.

3.0 CONCLUSIONS

It is concluded that the spring clips were not the cause of poor contact. The four spring clips were found to be of similar material appearing to be an Inconel alloy in a work hardened condition. In the condition the spring clips were found, maximum stiffness and retention can be expected. A possible cause for poor contact could be attributed to an adhesive, Dow Corning A-4000, found inside the contact pins. Excessive amounts were found in pins B and C.

4.0 RECOMMENDATIONS

It is recommended that for Connector Assembly MBC450-31 cleaning and inspection procedures be improved to eliminate the possibility of receiving parts which contain foreign matter.

5.0 PROCEDURES AND RESULTS

5.1 The connector submitted for evaluation was examined upon receipt with a wide field microscope, and then disassembled. The contact pins and clips were examined microscopically. A hardness survey was made on each clip using a Tukon Hardness Tester. A sample of the foreign matter found in the contact pins was submitted to the Quality Control Laboratory for spectroscopic analysis.

5.2 Microscopic examination of the connector upon receipt allows for the possible identification of anomalies. Microscopic examination of pins and clips allows for the identification of alloy systems and the determination of metallurgical structure. The hardness survey performed gives the approximate strength and stiffness of each clip. A spectroscopic comparison of the foreign matter found in the contact pins with a sample of Dow Corning A-4000 adhesive will possibily determine the cause of contamination.

5.3 Examination of the part indicated a foreign substance lodged in the contact pins. Figures 3 and 4 show the pins. Pins B and C show the most contamination. Figure 5 shows the spring clip removed from pin B. The base of the clip was somewhat distorted in disassembly. This foreign material could be the possible cause of poor contact. The spectroscopic analysis, reported in Quality Control Laboratory Test Report LSR 2479, 5-336-M-376, dated October 11, 1966 states that the material, which was found in the contact pins is similar to Dow Corning A-4000, an adhesive which is used to hold a silicon rubber insert in place on the connector.

Microhardness readings of the four spring clips indicate a relatively high hardness averaging to about Rockwell C 34.5. This hardness would give a part stiff enough to retain a mating pin. Table I lists the results of the hardness survey performed. The position of each reading is indicated in Figure 6, which is a cross section of an assembled pin and clip. The lower hardness at position 4 indicates a lesser degree of work hardening.

TABLE I

RESULTS OF HARDNESS SURVEY*

Pin	Position**			
A	35.0 R_C	35.0 R_C	35.0 R_C	33.0 R_C
B	36.5	35.5	35.0	32.5
C	35.5	35.0	35.0	32.5
D	35.5	34.5	34.5	32.0

* Hardness readings converted from 500 gram KHN to Rockwell C scale.

** Position of hardness readings indicated in Figure 6.

5.3 (Continued)

Examination of the microstructure of the four clips revealed they were of similar material. The austenitic matrix characteristic of nickel alloys can be seen in Figure 7, which shows the microstructure of clip B. The alloy has been reported to be an Inconel Alloy. Figure 8, higher power photomicrographs, reveal a highly cold worked structure.

There appears to be no metallurgical defects in the spring clips. Hardness is high enough to assure good retention of mating pins. The probable cause of poor contact is contamination from the application of the insert adhesive.

6.0 REFERENCES

UER U257303, August 3, 1966

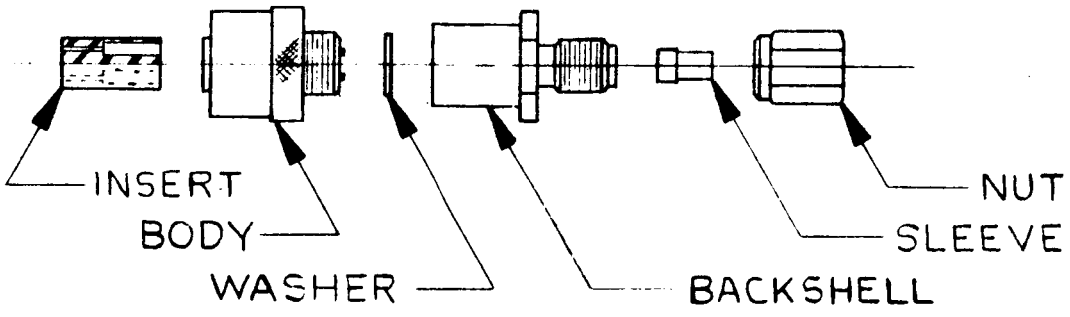
UER U262609, September 14, 1966

AAR AR257303, September 9, 1966

MBC 450

BAC 5162-28

LSR 2479, October 11, 1966



MBC450-27,-29,-31
CONNECTOR ASSEMBLY - BL TYPE

ASSEMBLY PART NO.	INSERT	BODY	WASHER	BACKSHELL
MBC450-27	MBC450-17	MBC450-1	MBC450-25	MBC450-21
MBC450-29	MBC450-17	MBC450-3	MBC450-25	MBC450-21
MBC450-31	MBC450-17	MBC450-5	MBC450-25	MBC450-21

ASSEMBLY PART NO.	SLEEVE	NUT
MBC450-27	MC125C2	MC124C2UW
MBC450-29	MC125C2	MC124C2UW
MBC450-31	MC125C2	MC124C2UW

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MB C450 SH 34

MBC450

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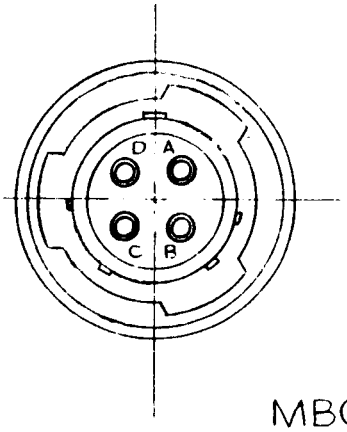
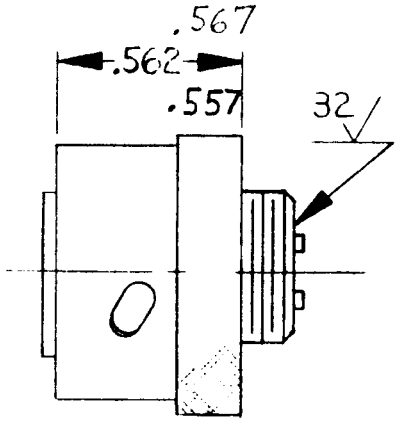
S-7800-84

FIGURE 1 CONNECTOR ASSEMBLY MBC 450-31





MBC450 -1,-3,&-5
CONNECTOR BODY - BL PLUG

PART NUMBER	CONTACT IDENTIFICATION		
	STAINLESS STL	CHROMEL	ALUMEL
MBC450 -1	A, B, C, D	—	—
MBC450 -3	C, D	B	A
MBC450 -5	A, B	C	D

DATE 12-20-65 REV A (3/16/66)

MB C450 SH 25

MBC450

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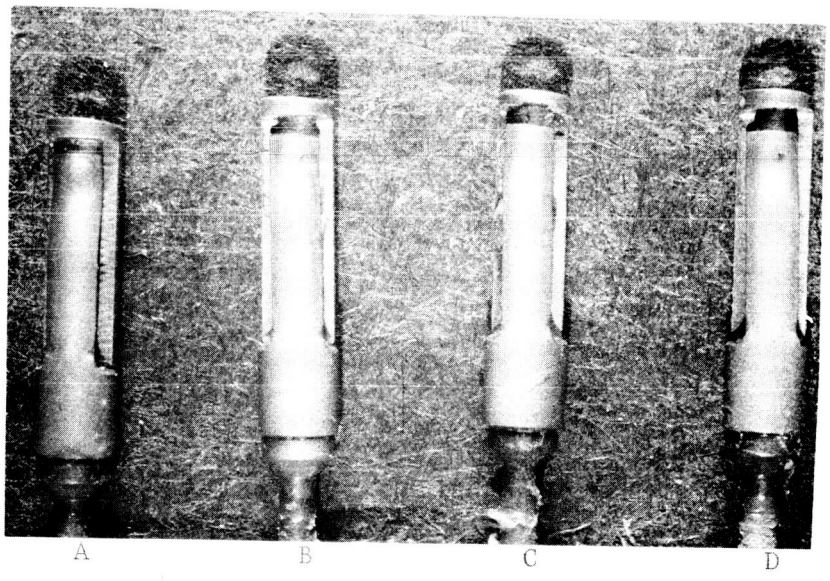
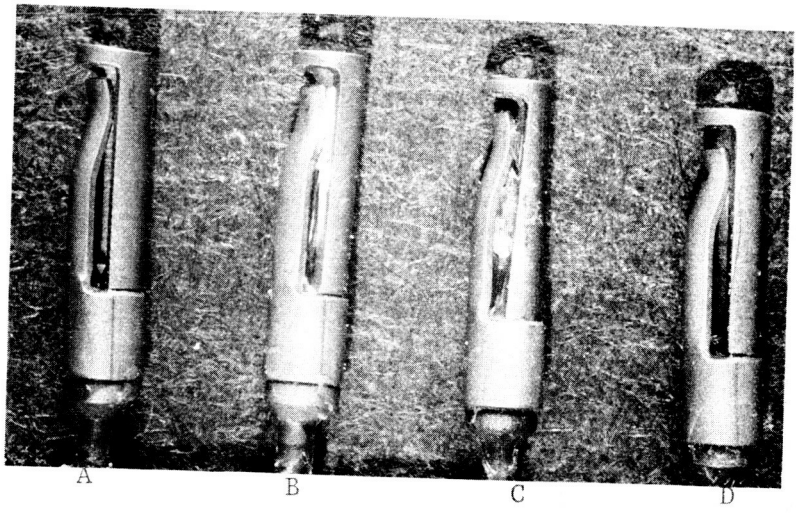
S-7500-84

FIGURE 2 CONNECTOR BODY MBC 450-5



A



B

FIGURE 3 CONTACT PINS, 5X

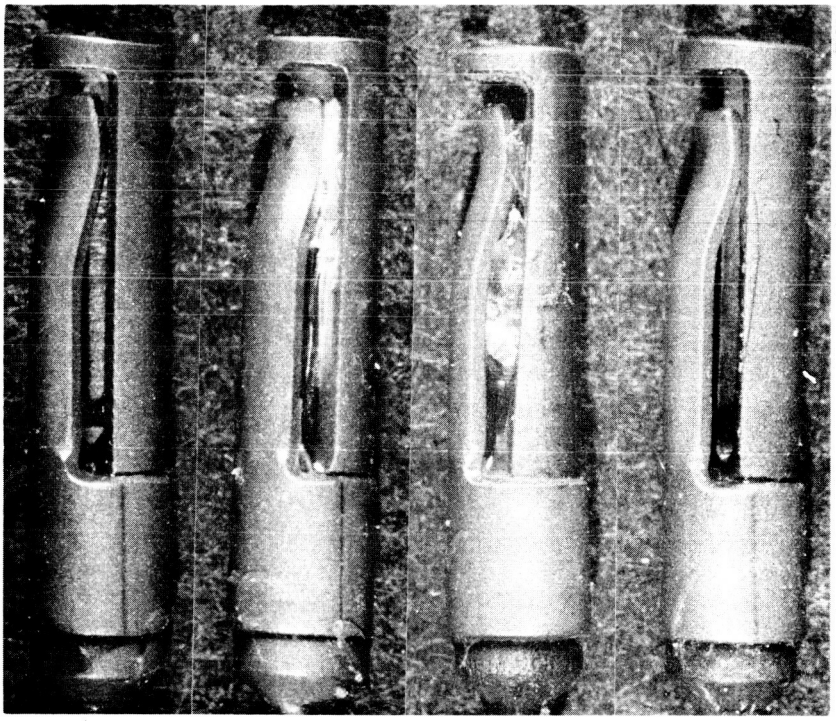


FIGURE 4 CONTACT PINS, 9X

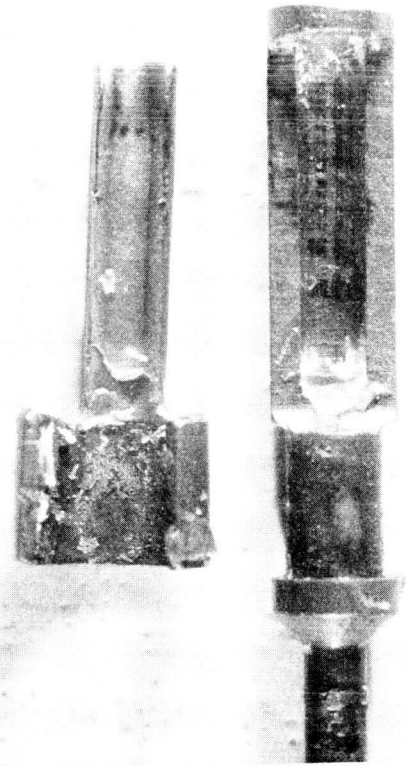


FIGURE 5 Pin B Disassembled, 8X

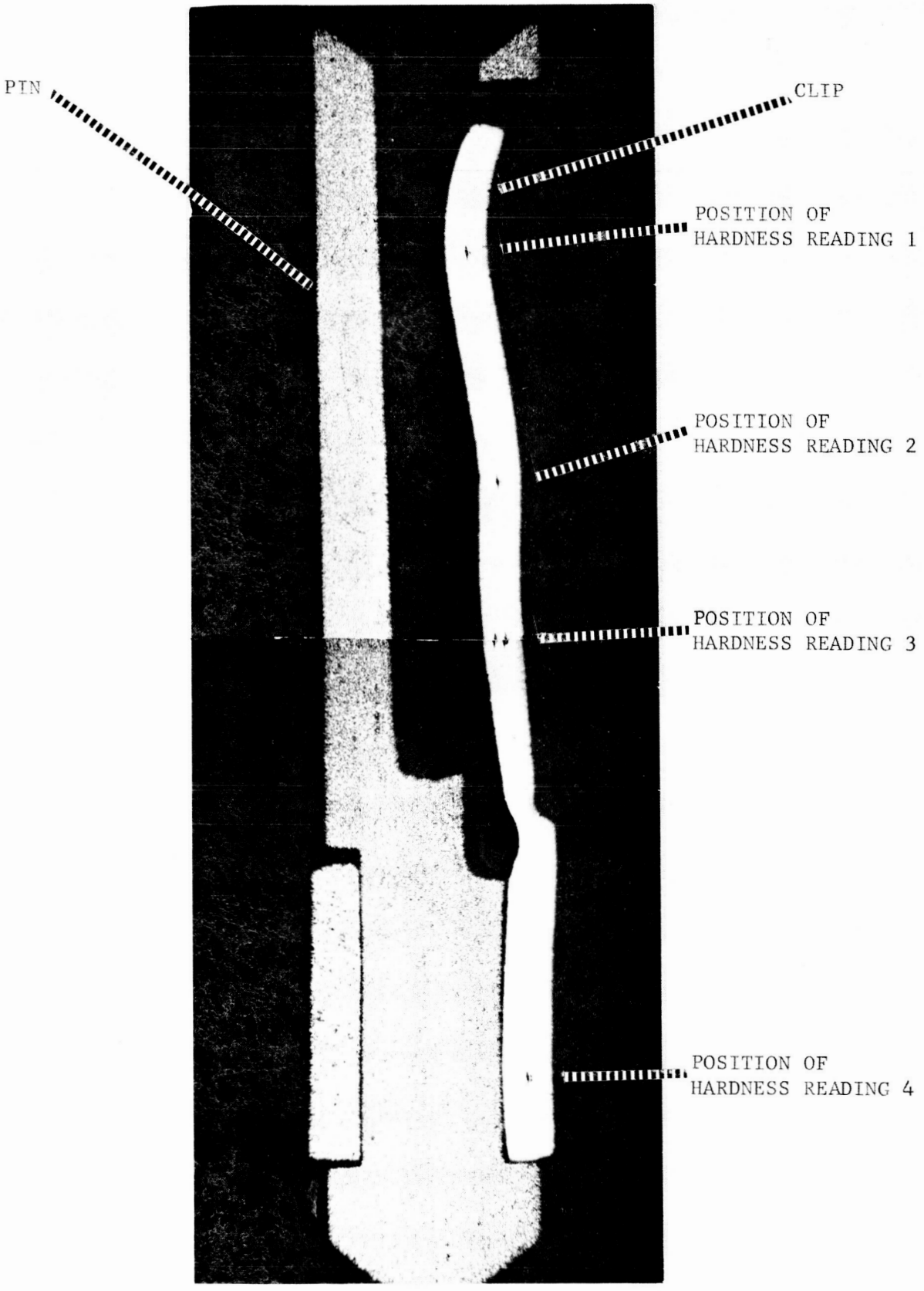
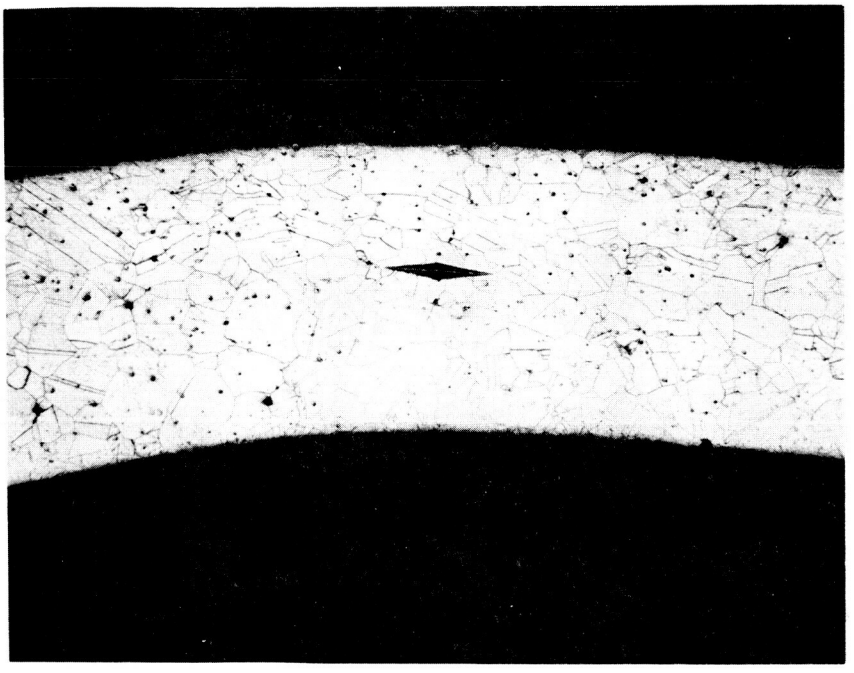


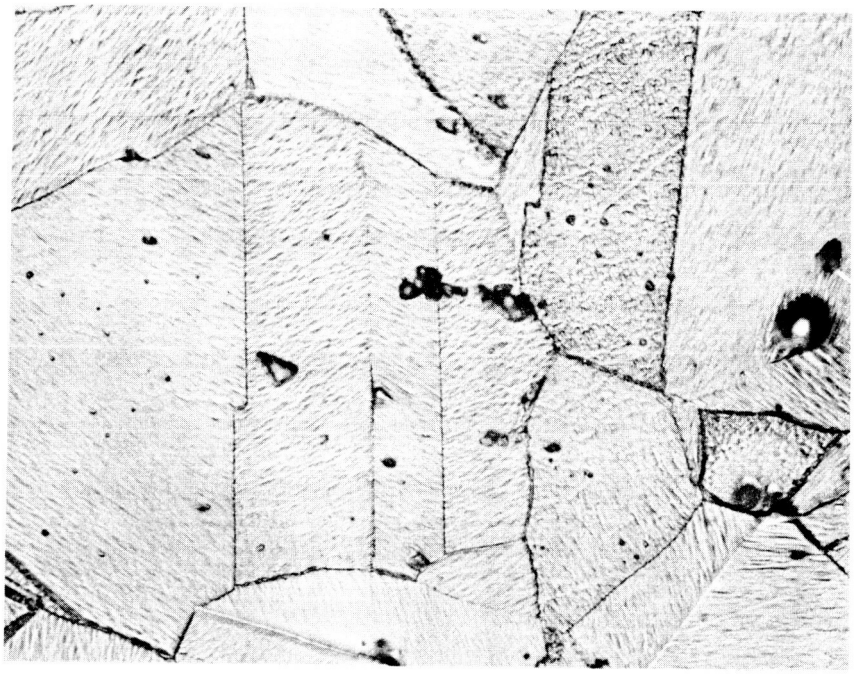
FIGURE 6 CROSS SECTION OF CONTACT PIN AND CLIP, 20X



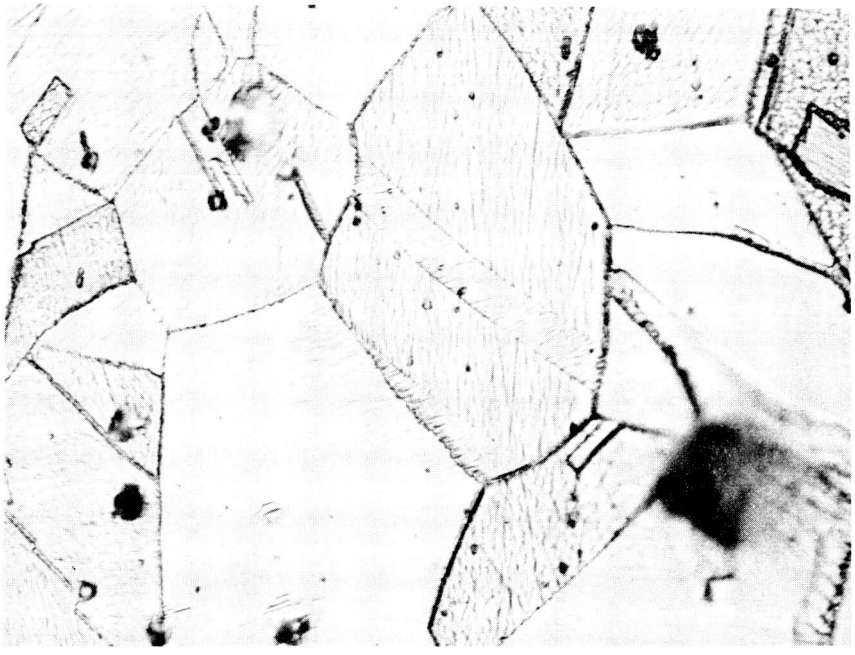
A - 100 X, etched

B - 200 X, etched

FIGURE 7 - MICROSTRUCTURE OF PIN B



A - 1000 X, etched



B - 1000 X, etched

FIGURE 8 MICROSTRUCTURE OF PIN B